Demand Reduction Analysis for Aberdeen Proving Grounds

Aberdeen, Maryland

Final Submission

Performed by

ENTECH

Entech Engineering, Inc.
Reading, Pennsylvania

June 1996

DEPARTMENT OF THE ARMY
CONSTRUCTION ENGINEERING RESEARCH LABORATORIES, CORPS OF ENGINEERS
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ABERDEEN PROVING GROUNDS
DEMAND REDUCTION ANALYSIS

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

ABERDEEN PROVING GROUNDS
DEMAND REDUCTION ANALYSIS

LIST OF TABLES AND FIGURES

LIST OF TABLES AND FIGURES (Continued)

LIST OF TABLES AND FIGURES (Continued)

1.0 EXECUTIVE SUMMARY

1.1 Project Authorization and Objectives

This project was authorized under the general provisions of Executive Order 12902 with specific implementation under the Army's Energy Engineering Analysis Program (EEAP). Entech Engineering, Inc. was commissioned under Contract DACA01-94-D-0037, Delivery Order 0010 issued by USAED, Mobile and Administered by USAED, Baltimore (Ted Gross). The objectives of the project are to research, identify, evaluate, and define energy saving projects that meet the Army's criteria and lead to energy savings at the Aberdeen Proving Grounds, Aberdeen campus, with respect to electrical demand reduction. Details of the authorization and objectives of this report, which delineates our contractual arrangement with the government, may be found in Section 8.11.

1.2 Synopsis of Findings

Entech Engineering, Inc. metered the Post at the substation level to provide some definition to the $7,000,000 annual electric cost consumed by the 19,500 people who occupy over 1,700 buildings and 13 million square feet on Post. Overall, Entech considered means of reducing the demand portion of the electrical cost estimated at over $2,900,000 per year.

A total of fourteen (14) Energy Conservation Opportunities (ECOs) were developed and evaluated. ECOs describe the means to reduce energy consumption and operating cost. Of the fourteen (14) ECOs, six (6) have been developed as economically feasible. The remaining eight (8) investigated did not prove to be economically attractive. Table 1.2.1 on the following page displays a summary of all ECOs investigated, prioritized by SIR.

Table 1.2.1, Summary of ECOs, Prioritized by SIR

ECO #	*ECO Description*	*Construction Cost*	*Energy & Maint. Savings*	*Payback Period (yrs)*	*SIR*
6	Peak Shaving with Emergency Generators	$1,100	$14,800	0.1	111.1
5	BG&E's Curtailment Service Rider	$4,900,000	$1,800,000	2.7	4.9
2	Upgrading Substation 4 & 9	$520,000	$140,000	3.7	3.6
3	Upgrading Substation 18	$1,500,000	$350,000	4.3	3.1
1A	New 115 kV Substation - 1 Transformer	$2,700,000	$585,000	4.6	2.9
1	New 115 kV Substation - 2 Transformers	$4,100,000	$585,000	7.0	1.9
8	Disable or Redirect Sensor for Doors	$240	$30	8.0	1.7
7	Electric Clothes Dryers to Natural Gas	$79,000	$10,100	7.8	1.3
12	Building 314 Ice Storage System	$340,000	$30,000	11.3	1.2
10	Electric Dryers to Gas - Includes New Dryers	$177,000	$10,100	17.5	0.6
13	Building 5046 Ice Storage System	$343,000	$13,000	26.4	0.1
11	Add Insulation to Freezer Wall	$10,500	$100	105.0	0.1
4	Emergency Generation Rider	$0	$11,700	0.0	0.0
9	Limit Use of Underfloor Warming System	$0	$1,800	0.0	0.0

In summary, a total of six (6) Energy Conservation Opportunities (ECO) have been recommended for implementation out of the fourteen (14) identified in this report. The ECOs were then categorized into one of five types of project. The five include:

1. Recommended ECIP
2. Recommended Non-ECIP General projects
3. Recommended Non-ECIP O&M projects
4. Recommended Non-ECIP LC/NC projects
5. Non-Feasible

The criteria used to place the ECOs into these categories is detailed in Section 7.0. Of those, only two were considered to be eligible for ECIP designation, as shown in the table below

Table 1.2.2, Recommended ECIP Projects, Prioritized by SIR

ECO #	*ECO Description*	*Construction Cost*	*Energy & Maint. Savings*	*Payback Period (yrs)*	*SIR*
5	BG&E's Curtailment Service Rider	$4,900,000	$1,800,000	2.7	4.9
1	New 115 kV Substation - 2 Transformers	$4,100,000	$585,000	7.0	1.9
	Totals	$9,000,000	$2,385,000	3.8	

The remaining four (4) ECOs that are recommended include one (1) Non-ECIP general projects and three (3) Non-ECIP low cost/no cost (LC/NC) projects. All tables are shown in the following tables. There are no recommended Non-ECIP O&M projects.

Table 1.2.3, Recommended Non-ECIP General Projects, Prioritized by SIR

ECO #	*ECO Description*	*Construction Cost*	*Energy & Maint. Savings*	*Payback Period (yrs)*	*SIR*
7	Electric Clothes Dryers to Natural Gas	$79,000	$10,100	7.8	1.3

Table 1.2.4, Recommended Non-ECIP O&M Projects, Prioritized by SIR

ECO #	*ECO Description*	*Construction Cost*	*Energy & Maint. Savings*	*Payback Period (yrs)*	*SIR*

Table 1.2.5, Recommended Non-ECIP LC/NC Projects, Prioritized by SIR

ECO #	ECO Description	Construction Cost	Energy & Maint. Savings	Payback Period (yrs)	SIR
6	Peak Shaving with Emergency Generators	$1,100	$14,800	0.1	111.1
8	Disable or Redirect Sensor for Doors	$240	$30	8.0	1.7
9	Limit Use of Underfloor Warming System	$0	$1,800	0.0	0.0
	Totals	$1,340	$16,630	0.1	

Depending on which ECOs are implemented, it is believed total energy cost savings realized could be over $2.4 million per year. This will be a reduction of 34% of the total electric cost and a 24% reduction in total energy costs.

The non-recommended alternatives are listed below in Table 1.2.6. The eight (8) non-feasible ECOs have a payback period over 10 years or an SIR below 1.25.

Table 1.2.6, Non-Feasible Projects, Prioritized by SIR

ECO #	ECO Description	Construction Cost	Energy & Maint. Savings	Payback Period (yrs)	SIR
1A	New 115 kV Substation - 1 Transformer	$2,700,000	$585,000	4.6	2.9
2	Upgrading Substation 4 & 9	$520,000	$140,000	3.7	3.6
3	Upgrading Substation 18	$1,500,000	$350,000	4.3	3.1
4	Emergency Generation Rider	$0	$11,700	0.0	0.0
12	Building 314 Ice Storage System	$340,000	$30,000	11.3	1.2
10	Electric Dryers to Gas - Includes New Dryers	$177,000	$10,100	17.5	0.6
13	Building 5046 Ice Storage System	$343,000	$13,000	26.4	0.1
11	Add Insulation to Freezer Wall	$10,500	$100	105.0	0.1

The following sections of this report describe in detail the findings as outlined above and contain the necessary cost estimate and calculation backup data as required. The reader is encouraged to carefully review each of the following report sections to understand the assumptions, methodology, and discussions involved.

ATTACHMENT 8.9
LCCID DATA

Life Cycle Cost Analysis Study:
nergy Conservation Investment Program (ECIP) LCCID FY96
nstallation & Location: Aberdeen Proving Grounds
Region data: MARYLAND Census Region: 3
roject NO. & Title: 4130.06 New 115 kV Substation - 2 Transformers
iscal Year: 1995 Discrete Portion: ECO-1
Analysis Date: 04/12/96 Economic Life: 20 years
repared by: SAB

ECIP Summary Report

. Investment

A. Construction Cost	3560000
B. SIOH	270000
C. Design Cost	270000
D. Total Cost (1A+1B+1C)	$4,100,000
E. Salvage Value of Existing Equip.	$0
F. Public Utility Company Rebate	$0
G. Total Investment (1D-1E-1F)	$4,100,000

. Energy Savings (+) / Costs (-)
Date of NISTIR 85-3273-X used for Discount Factors Oct 1995

Fuel	Price	Price Units	Usage Savings	Usage Units	Annual Savings	Discount Factor	Discounted Savings
Electricity	$8.8	/Mbtus	-4,429	Mbtus	-$38,926	13.84	-$538,743
Elec. Deman					$640,000	13.47	$8,620,800
TOTAL			-4,429	Mbtus	$601,074		$8,082,058

. Non Energy Savings (+) / Costs (-)

Item	Savings/ Cost	Year	Discount Factor	Discounted Savings/Cost
New	-$15,000	Annual	13.47	-$202,050
ANNUAL TOTAL	-$15,000			-$202,050
ONE TIME TOTAL	$0			$0
TOTAL	-$15,000			-$202,050

. First Year Dollar Savings $586,074
5. Simple Payback Period (Years) 7.0
. Total Net Discounted Savings $7,880,008
. Savings to Investment Ratio 1.92
If < 1, Project does not qualify
8. Adjusted Internal Rate of Return 7.56%

Life Cycle Cost Analysis Study:
Energy Conservation Investment Program (ECIP) LCCID FY96
Installation & Location: Aberdeen Proving Grounds
Region data: MARYLAND Census Region: 3
Project NO. & Title: 4130.06 New 115 kV Substation - 1 Transformers
Fiscal Year: 1995 Discrete Portion: ECO-1A
Analysis Date: 04/12/96 Economic Life: 20 years
Prepared by: SAB

ECIP Summary Report

1. Investment

A. Construction Cost	2300000
B. SIOH	200000
C. Design Cost	200000
D. Total Cost (1A+1B+1C)	$2,700,000
E. Salvage Value of Existing Equip.	$0
F. Public Utility Company Rebate	$0
G. Total Investment (1D-1E-1F)	$2,700,000

2. Energy Savings (+) / Costs (-)
Date of NISTIR 85-3273-X used for Discount Factors Oct 1995

Fuel	Price	Price Units	Usage Savings	Usage Units	Annual Savings	Discount Factor	Discounted Savings
Electricity	$8.8	/Mbtus	-4,429	Mbtus	-$38,926	13.84	-$538,743
Elec. Deman					$640,000	13.47	$8,620,800
TOTAL			-4,429	Mbtus	$601,074		$8,082,058

3. Non Energy Savings (+) / Costs (-)

Item	Savings/ Cost	Year	Discount Factor	Discounted Savings/Cost
New	-$15,000	Annual	13.47	-$202,050
ANNUAL TOTAL	-$15,000			-$202,050
ONE TIME TOTAL	$0			$0
TOTAL	-$15,000			-$202,050

4. First Year Dollar Savings $586,074
5. Simple Payback Period (Years) 4.61
6. Total Net Discounted Savings $7,880,008
7. Savings to Investment Ratio 2.92
If < 1, Project does not qualify
8. Adjusted Internal Rate of Return 9.83%

Life Cycle Cost Analysis Study:
[redacted]nergy Conservation Investment Program (ECIP) LCCID FY96
[redacted]nstallation & Location: Aberdeen Proving Grounds
Region data: MARYLAND Census Region: 3
[redacted]roject NO. & Title: 4130.06 Upgrading Substations 4 & 9
[redacted]iscal Year: 1995 Discrete Portion: ECO-2
Analysis Date: 04/12/96 Economic Life: 20 years
[redacted]repared by: SAB

ECIP Summary Report

[redacted]. Investment	
A. Construction Cost	450000
B. SIOH	35000
C. Design Cost	35000
D. Total Cost (1A+1B+1C)	$520,000
E. Salvage Value of Existing Equip.	$0
F. Public Utility Company Rebate	$0
G. Total Investment (1D-1E-1F)	$520,000

[redacted]. Energy Savings (+) / Costs (-)
[redacted]ate of NISTIR 85-3273-X used for Discount Factors Oct 1995

Fuel	Price	Price Units	Usage Savings	Usage Units	Annual Savings	Discount Factor	Discounted Savings
Electricity	$.	/Mbtus	0	Mbtus	$0	13.84	$0
Elec. Deman					$140,000	13.47	$1,885,800
TOTAL			0	Mbtus	$140,000		$1,885,800

[redacted]. Non Energy Savings (+) / Costs (-)

Item	Savings/ Cost	Year	Discount Factor	Discounted Savings/Cost
ANNUAL TOTAL	$0			$0
ONE TIME TOTAL	$0			$0
TOTAL	$0			$0

[redacted]. First Year Dollar Savings	$140,000
[redacted]. Simple Payback Period (Years)	3.71
6. Total Net Discounted Savings	$1,885,800
7. Savings to Investment Ratio	3.63
If < 1, Project does not qualify	
[redacted]. Adjusted Internal Rate of Return	11.03%

Life Cycle Cost Analysis Study:
nergy Conservation Investment Program (ECIP) LCCID FY96
nstallation & Location: Aberdeen Proving Grounds
Region data: MARYLAND Census Region: 3
roject NO. & Title: 4130.06 Upgrading Substations 18
iscal Year: 1995 Discrete Portion: ECO-3
Analysis Date: 04/12/96 Economic Life: 20 years
repared by: SAB

ECIP Summary Report

. Investment

A. Construction Cost	1300000
B. SIOH	100000
C. Design Cost	100000
D. Total Cost (1A+1B+1C)	$1,500,000
E. Salvage Value of Existing Equip.	$0
F. Public Utility Company Rebate	$0
G. Total Investment (1D-1E-1F)	$1,500,000

. Energy Savings (+) / Costs (-)
ate of NISTIR 85-3273-X used for Discount Factors Oct 1995

Fuel	Price	Price Units	Usage Savings	Usage Units	Annual Savings	Discount Factor	Discounted Savings
Electricity	$.	/Mbtus	0	Mbtus	$0	13.84	$0
Elec. Deman					$350,000	13.47	$4,714,500
TOTAL			0	Mbtus	$350,000		$4,714,500

. Non Energy Savings (+) / Costs (-)

Item	Savings/ Cost	Year	Discount Factor	Discounted Savings/Cost
ANNUAL TOTAL	$0			$0
ONE TIME TOTAL	$0			$0
TOTAL	$0			$0

. First Year Dollar Savings	$350,000
. Simple Payback Period (Years)	4.29
6. Total Net Discounted Savings	$4,714,500
7. Savings to Investment Ratio	3.14
If < 1, Project does not qualify	
8. Adjusted Internal Rate of Return	10.23%

Life Cycle Cost Analysis Study:
[redacted]nergy Conservation Investment Program (ECIP) LCCID FY96
Installation & Location: Aberdeen Proving Grounds
Region data: MARYLAND Census Region: 3
[redacted]roject NO. & Title: 4130.06 Emergency Generation Rider
[redacted]iscal Year: 1995 Discrete Portion: ECO-4
Analysis Date: 04/12/96 Economic Life: 20 years
[redacted]repared by: SAB

ECIP Summary Report

[redacted]. Investment

A. Construction Cost	0
B. SIOH	0
C. Design Cost	0
D. Total Cost (1A+1B+1C)	$0
E. Salvage Value of Existing Equip.	$0
F. Public Utility Company Rebate	$0
G. Total Investment (1D-1E-1F)	$0

***** No investment costs. Other items should be checked. *****

2. Energy Savings (+) / Costs (-)
Date of NISTIR 85-3273-X used for Discount Factors Oct 1995

Fuel	Price	Price Units	Usage Savings	Usage Units	Annual Savings	Discount Factor	Discounted Savings
Electricity	$11.7	/Mbtus	143	Mbtus	$1,676	13.84	$23,193
Elec. Deman					$16,700	13.47	$224,949
Residual Oi	$5.1	/Mbtus	-178	Mbtus	-$899	17.62	-$15,839
Natural Gas	$5.1	/Mbtus	-300	Mbtus	-$1,530	17.89	-$27,372
TOTAL			-335	Mbtus	$15,947		$204,932

[redacted]. Non Energy Savings (+) / Costs (-)

Item	Savings/ Cost	Year	Discount Factor	Discounted Savings/Cost
New	-$4,300	Annual	13.47	-$57,921
ANNUAL TOTAL	-$4,300			-$57,921
ONE TIME TOTAL	$0			$0
TOTAL	-$4,300			-$57,921

[redacted]. First Year Dollar Savings $11,647
5. Simple Payback Period (Years) 0
6. Total Net Discounted Savings $147,011
[redacted]. Savings to Investment Ratio NA
If < 1, Project does not qualify
8. Adjusted Internal Rate of Return -100.0%

Life Cycle Cost Analysis — Study: LCCID FY96

Energy Conservation Investment Program (ECIP)
Installation & Location: Aberdeen Proving Grounds
Region data: MARYLAND Census Region: 3
Project NO. & Title: 4130.06 Curtailment Service Rider
Fiscal Year: 1995 Discrete Portion: ECO-5
Analysis Date: 04/12/96 Economic Life: 20 years
Prepared by: SAB

ECIP Summary Report

1. Investment	
A. Construction Cost	4300000
B. SIOH	300000
C. Design Cost	300000
D. Total Cost (1A+1B+1C)	$4,900,000
E. Salvage Value of Existing Equip.	$0
F. Public Utility Company Rebate	$0
G. Total Investment (1D-1E-1F)	$4,900,000

2. Energy Savings (+) / Costs (-)
Date of NISTIR 85-3273-X used for Discount Factors Oct 1995

Fuel	Price	Price Units	Usage Savings	Usage Units	Annual Savings	Discount Factor	Discounted Savings
Electricity	$14.9	/Mbtus	2,048	Mbtus	$30,597	13.84	$423,464
Elec. Deman					$1,800,000	13.47	$24,246,000
Residual Oi	$5.1	/Mbtus	-6,824	Mbtus	-$34,461	17.62	-$607,206
TOTAL			-4,776	Mbtus	$1,796,136		$24,062,260

3. Non Energy Savings (+) / Costs (-)

Item	Savings/ Cost	Year	Discount Factor	Discounted Savings/Cost
ANNUAL TOTAL	$0			$0
ONE TIME TOTAL	$0			$0
TOTAL	$0			$0

4. First Year Dollar Savings	$1,796,136
5. Simple Payback Period (Years)	2.73
6. Total Net Discounted Savings	$24,062,260
7. Savings to Investment Ratio	4.91
If < 1, Project does not qualify	
8. Adjusted Internal Rate of Return	12.72%

Life Cycle Cost Analysis Study:
nergy Conservation Investment Program (ECIP) LCCID FY96
nstallation & Location: Aberdeen Proving Grounds
Region data: MARYLAND Census Region: 3
roject NO. & Title: 4130.06 Peak Shaving with Emergency Generators
iscal Year: 1995 Discrete Portion: ECO-6
Analysis Date: 04/12/96 Economic Life: 20 years
repared by: SAB

ECIP Summary Report

. Investment

A. Construction Cost	1100
B. SIOH	0
C. Design Cost	66
D. Total Cost (1A+1B+1C)	$1,166
E. Salvage Value of Existing Equip.	$0
F. Public Utility Company Rebate	$0
G. Total Investment (1D-1E-1F)	$1,166

. Energy Savings (+) / Costs (-)
ate of NISTIR 85-3273-X used for Discount Factors Oct 1995

Fuel	Price	Price Units	Usage Savings	Usage Units	Annual Savings	Discount Factor	Discounted Savings
Electricity	$14.9	/Mbtus	1,051	Mbtus	$15,702	13.84	$217,315
Elec. Deman					$17,000	13.47	$228,990
Residual Oi	$5.1	/Mbtus	-1,302	Mbtus	-$6,575	17.62	-$115,853
Natural Gas	$5.1	/Mbtus	-2,202	Mbtus	-$11,230	17.89	-$200,908
TOTAL			-2,453	Mbtus	$14,897		$129,543

. Non Energy Savings (+) / Costs (-)

Item	Savings/ Cost	Year	Discount Factor	Discounted Savings/Cost
				$0
ANNUAL TOTAL	$0			$0
ONE TIME TOTAL	$0			$0
TOTAL	$0			

4. First Year Dollar Savings	$14,897
5. Simple Payback Period (Years)	.08
6. Total Net Discounted Savings	$129,543
7. Savings to Investment Ratio	111.1
If < 1, Project does not qualify	
8. Adjusted Internal Rate of Return	31.75%

Life Cycle Cost Analysis Study: LCCID FY96
Energy Conservation Investment Program (ECIP)
Installation & Location: Aberdeen Proving Grounds
Region data: MARYLAND Census Region: 3
Project NO. & Title: 4130.06 Electric Clothes Dryers to Natural Gas
Fiscal Year: 1995 Discrete Portion: ECO-7
Analysis Date: 04/12/96 Economic Life: 20 years
Prepared by: SAB

ECIP Summary Report

1. Investment	
A. Construction Cost	68000
B. SIOH	6000
C. Design Cost	5000
D. Total Cost (1A+1B+1C)	$79,000
E. Salvage Value of Existing Equip.	$0
F. Public Utility Company Rebate	$0
G. Total Investment (1D-1E-1F)	$79,000

2. Energy Savings (+) / Costs (-)
Date of NISTIR 85-3273-X used for Discount Factors Oct 1995

Fuel	Price	Price Units	Usage Savings	Usage Units	Annual Savings	Discount Factor	Discounted Savings
Electricity	$9.8	/Mbtus	1,258	Mbtus	$12,291	13.84	$170,103
Elec. Deman					$7,000	13.47	$94,290
Natural Gas	$5.1	/Mbtus	-1,799	Mbtus	-$9,175	17.89	-$164,139
TOTAL			-541	Mbtus	$10,116		$100,254

3. Non Energy Savings (+) / Costs (-)

Item	Savings/ Cost	Year	Discount Factor	Discounted Savings/Cost
				$0
ANNUAL TOTAL	$0			$0
ONE TIME TOTAL	$0			$0
TOTAL	$0			

4. First Year Dollar Savings	$10,116
5. Simple Payback Period (Years)	7.81
6. Total Net Discounted Savings	$100,254
7. Savings to Investment Ratio	1.27
If < 1, Project does not qualify	
8. Adjusted Internal Rate of Return	5.35%

Life Cycle Cost Analysis Study:
nergy Conservation Investment Program (ECIP) LCCID FY96
Installation & Location: Aberdeen Proving Grounds
Region data: MARYLAND Census Region: 3
roject NO. & Title: 4130.06 Disable Door Sensor
iscal Year: 1995 Discrete Portion: ECO-8
Analysis Date: 04/12/96 Economic Life: 20 years
repared by: SAB

ECIP Summary Report

. Investment

A. Construction Cost	240
B. SIOH	0
C. Design Cost	0
D. Total Cost (1A+1B+1C)	$240
E. Salvage Value of Existing Equip.	$0
F. Public Utility Company Rebate	$0
G. Total Investment (1D-1E-1F)	$240

. Energy Savings (+) / Costs (-)
Date of NISTIR 85-3273-X used for Discount Factors Oct 1995

Fuel	Price	Price Units	Usage Savings	Usage Units	Annual Savings	Discount Factor	Discounted Savings
Electricity	$9.8	/Mbtus	2	Mbtus	$20	13.84	$270
Elec. Deman					$10	13.47	$135
TOTAL			2	Mbtus	$30		$405

. Non Energy Savings (+) / Costs (-)

Item	Savings/ Cost	Year	Discount Factor	Discounted Savings/Cost
ANNUAL TOTAL	$0			$0
ONE TIME TOTAL	$0			$0
TOTAL	$0			$0

4. First Year Dollar Savings	$30
5. Simple Payback Period (Years)	8.12
6. Total Net Discounted Savings	$405
7. Savings to Investment Ratio	1.69
If < 1, Project does not qualify	
8. Adjusted Internal Rate of Return	6.86%

Life Cycle Cost Analysis Study:
Energy Conservation Investment Program (ECIP) LCCID FY96
Installation & Location: Aberdeen Proving Grounds
Region data: MARYLAND Census Region: 3
Project NO. & Title: 4130.06 Limit Floor Warming System
Fiscal Year: 1995 Discrete Portion: ECO-9
Analysis Date: 04/12/96 Economic Life: 20 years
Prepared by: SAB

ECIP Summary Report

1. Investment

A. Construction Cost	0
B. SIOH	0
C. Design Cost	0
D. Total Cost (1A+1B+1C)	$0
E. Salvage Value of Existing Equip.	$0
F. Public Utility Company Rebate	$0
G. Total Investment (1D-1E-1F)	$0

***** No investment costs. Other items should be checked. *****

2. Energy Savings (+) / Costs (-)

Date of NISTIR 85-3273-X used for Discount Factors Oct 1995

Fuel	Price	Price Units	Usage Savings	Usage Units	Annual Savings	Discount Factor	Discounted Savings
Electricity	$7.8	/Mbtus	129	Mbtus	$1,000	13.84	$13,837
Elec. Deman					$800	13.47	$10,776
TOTAL			129	Mbtus	$1,800		$24,613

3. Non Energy Savings (+) / Costs (-)

Item	Savings/ Cost	Year	Discount Factor	Discounted Savings/Cost
ANNUAL TOTAL	$0			$0
ONE TIME TOTAL	$0			$0
TOTAL	$0			$0

4. First Year Dollar Savings	$1,800
5. Simple Payback Period (Years)	0
6. Total Net Discounted Savings	$24,613
7. Savings to Investment Ratio	NA
If < 1, Project does not qualify	
8. Adjusted Internal Rate of Return	-100.0%

Life Cycle Cost Analysis Study:
nergy Conservation Investment Program (ECIP) LCCID FY96
Installation & Location: Aberdeen Proving Grounds
Region data: MARYLAND Census Region: 3
roject NO. & Title: 4130.06 Electric Dryers to Gas - New Dryers
iscal Year: 1995 Discrete Portion: ECO-11
Analysis Date: 04/12/96 Economic Life: 20 years
Prepared by: SAB

ECIP Summary Report

1. Investment

A. Construction Cost	154000
B. SIOH	12000
C. Design Cost	11000
D. Total Cost (1A+1B+1C)	$177,000
E. Salvage Value of Existing Equip.	$0
F. Public Utility Company Rebate	$0
G. Total Investment (1D-1E-1F)	$177,000

2. Energy Savings (+) / Costs (-)
Date of NISTIR 85-3273-X used for Discount Factors Oct 1995

Fuel	Price	Price Units	Usage Savings	Usage Units	Annual Savings	Discount Factor	Discounted Savings
Electricity	$9.8	/Mbtus	1,258	Mbtus	$12,291	13.84	$170,103
Elec. Deman					$7,000	13.47	$94,290
Natural Gas	$5.1	/Mbtus	-1,799	Mbtus	-$9,175	17.89	-$164,139
TOTAL			-541	Mbtus	$10,116		$100,254

3. Non Energy Savings (+) / Costs (-)

Item	Savings/ Cost	Year	Discount Factor	Discounted Savings/Cost
ANNUAL TOTAL	$0			$0
ONE TIME TOTAL	$0			$0
TOTAL	$0			$0

4. First Year Dollar Savings	$10,116
5. Simple Payback Period (Years)	17.5
6. Total Net Discounted Savings	$100,254
7. Savings to Investment Ratio	.57
If < 1, Project does not qualify	
8. Adjusted Internal Rate of Return	1.18%

Life Cycle Cost Analysis Study: LCCID FY96
nergy Conservation Investment Program (ECIP)
nstallation & Location: Aberdeen Proving Grounds
Region data: MARYLAND Census Region: 3
roject NO. & Title: 4130.06 Insulation
iscal Year: 1995 Discrete Portion: ECO-12
Analysis Date: 04/12/96 Economic Life: 20 years
Prepared by: SAB

ECIP Summary Report

1. Investment	
A. Construction Cost	9100
B. SIOH	700
C. Design Cost	700
D. Total Cost (1A+1B+1C)	$10,500
E. Salvage Value of Existing Equip.	$0
F. Public Utility Company Rebate	$0
G. Total Investment (1D-1E-1F)	$10,500

2. Energy Savings (+) / Costs (-)
Date of NISTIR 85-3273-X used for Discount Factors Oct 1995

Fuel	Price	Price Units	Usage Savings	Usage Units	Annual Savings	Discount Factor	Discounted Savings
Electricity	$6.7	/Mbtus	6	Mbtus	$40	13.84	$554
					$60	13.47	$808
Elec. Deman			6	Mbtus	$100		$1,362
TOTAL							

3. Non Energy Savings (+) / Costs (-)

Item	Savings/ Cost	Year	Discount Factor	Discounted Savings/Cost
				$0
ANNUAL TOTAL	$0			$0
ONE TIME TOTAL	$0			$0
TOTAL	$0			

4. First Year Dollar Savings	$100
5. Simple Payback Period (Years)	104.98
6. Total Net Discounted Savings	$1,362
7. Savings to Investment Ratio	.13
If < 1, Project does not qualify	
8. Adjusted Internal Rate of Return	-6.01%

Life Cycle Cost Analysis Study: LCCID FY96
Energy Conservation Investment Program (ECIP)
Installation & Location: Aberdeen Proving Grounds
Region data: MARYLAND Census Region: 3
Project NO. & Title: 4130.06 Ice Storage for Building 314
Fiscal Year: 1995 Discrete Portion: ECO-13
Analysis Date: 04/12/96 Economic Life: 20 years
Prepared by: SAB

ECIP Summary Report

1. Investment	
A. Construction Cost	296000
B. SIOH	22000
C. Design Cost	22000
D. Total Cost (1A+1B+1C)	$340,000
E. Salvage Value of Existing Equip.	$0
F. Public Utility Company Rebate	$0
G. Total Investment (1D-1E-1F)	$340,000

2. Energy Savings (+) / Costs (-)
Date of NISTIR 85-3273-X used for Discount Factors Oct 1995

Fuel	Price	Price Units	Usage Savings	Usage Units	Annual Savings	Discount Factor	Discounted Savings
Electricity	$16.4	/Mbtus	-104	Mbtus	-$1,700	13.84	-$23,534
Elec. Deman					$31,700	13.47	$426,999
TOTAL			-104	Mbtus	$30,000		$403,466

3. Non Energy Savings (+) / Costs (-)

Item	Savings/ Cost	Year	Discount Factor	Discounted Savings/Cost
				$0
ANNUAL TOTAL	$0			$0
ONE TIME TOTAL	$0			$0
TOTAL	$0			

4. First Year Dollar Savings	$30,000
5. Simple Payback Period (Years)	11.33
6. Total Net Discounted Savings	$403,465
7. Savings to Investment Ratio	1.19
If < 1, Project does not qualify	
8. Adjusted Internal Rate of Return	4.99%

Life Cycle Cost Analysis Study:
Energy Conservation Investment Program (ECIP) LCCID FY96
Installation & Location: Aberdeen Proving Grounds
Region data: MARYLAND Census Region: 3
Project NO. & Title: 4130.06 Ice Storage for Building 5046
Fiscal Year: 1995 Discrete Portion: ECO-14
Analysis Date: 04/12/96 Economic Life: 20 years
Prepared by: SAB

ECIP Summary Report

1. Investment

A. Construction Cost	298000
B. SIOH	23000
C. Design Cost	22000
D. Total Cost (1A+1B+1C)	$343,000
E. Salvage Value of Existing Equip.	$0
F. Public Utility Company Rebate	$0
G. Total Investment (1D-1E-1F)	$343,000

2. Energy Savings (+) / Costs (-)
Date of NISTIR 85-3273-X used for Discount Factors Oct 1995

Fuel	Price	Price Units	Usage Savings	Usage Units	Annual Savings	Discount Factor	Discounted Savings
Electricity	$15.8	/Mbtus	-57	Mbtus	-$900	13.84	-$12,456
Elec. Deman					$13,900	13.47	$187,233
TOTAL			-57	Mbtus	$13,000		$174,777

3. Non Energy Savings (+) / Costs (-)

Item	Savings/ Cost	Year	Discount Factor	Discounted Savings/Cost
ANNUAL TOTAL	$0			$0
ONE TIME TOTAL	$0			$0
TOTAL	$0			$0

4. First Year Dollar Savings	$13,000
5. Simple Payback Period (Years)	26.38
6. Total Net Discounted Savings	$174,777
7. Savings to Investment Ratio	.51
If < 1, Project does not qualify	
8. Adjusted Internal Rate of Return	.65%

Summary of Recommended ECOs

ECO #	1st yr. Energy Savings, MBTU	1st $ Savings
1	- 4,429	586,074
5	- 4,776	1,796,136
6	- 2,453	14,897
7	- 541	10,116
8	2	30
9	129	1,800
Totals	- 12,068	2,409,053
		K$ 2,409